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Chapter 4

The effect of a teacher-focused intervention on the motivation of students with deafblindness.

Abstract

Research on Self-Determination Theory has shown that teachers' need-supportive behavior is associated with student motivation and engagement. The purpose of this study is to examine the effectiveness of an intervention aimed at increasing the motivation of students with congenital and acquired deafblindness by enhancing teachers' need-supportive behavior. To assess the intervention effect, this study follows a multiple case study design. Teacher questionnaires were administered and video observations of teacher-student interactions were made during pre-test, post-test, and follow-up phases. The results showed that teachers provided involvement most, followed by structure and autonomy support. Teachers' provision of structure and autonomy seem to improve most after the intervention. In general, teachers of students with congenital deafblindness showed larger intervention effects than teachers of students with acquired deafblindness. The results also provide indications that students' levels of engagement improved after the intervention.

KEYWORDS

Self-Determination Theory, motivation, engagement, congenital deafblindness, acquired deafblindness, intervention

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Introduction

Motivation is an important factor that influences learning, performance, and well-being (Deci & Ryan, 2000). A growing body of research highlights the importance of teacher-student interactions on students' motivation (Katz, Kaplan, & Gueta, 2010). Unfortunately, research about the impact on students with deafblindness is scarce. Moreover, studies that look at the relationship between teacher-student interactions and motivation often lack a sound theoretical framework (see chapter 1 and 2). This is striking because teacher-student interactions are crucial for students with deafblindness. In this context especially, students' motivation is highly dependent on the teacher. The teacher and student need to be highly interconnected, much more so than teachers and students without sensory impairments. This greater need for connectedness between the teacher and the student who is deafblind is due to the loss of both distance senses. A teacher needs to gently coach the student to expand experiences. Trust is essential to learning for students who are deafblind. If a student is fearful and isolated, their motivation for many tasks and experiences will be low. Therefore, research on teacher-student interactions is of added value because it could provide insights into how teacher-student interactions influence students' motivation.

THEORETICAL BACKGROUND

Self-Determination Theory (SDT) offers a framework for linking teacher-student interactions with students' motivation (Deci & Ryan, 1985; 2000). SDT postulates that humans are innately predisposed towards mastering challenges and psychological growth. Students are expected to be naturally active, intrinsically motivated, and freely engaged in activities they find interesting. Engagement has been described as the outward manifestation of student motivation (Skinner, Kindermann, & Furrer, 2009). It refers to the intensity and emotional quality of students' involvement in initiating and carrying out learning activities (Connell & Wellborn, 1991). Students' motivation and engagement is expected to lead to desired educational outcomes related to well-being, persistence, and achievement.

SDT stresses the importance of context in influencing students' motivation. Teachers are expected to play an important role: by supporting students' basic psychological needs, teachers foster students' motivation for school activities (Deci & Ryan, 2000). In order for students to be engaged in an activity, they must perceive that their basic psychological needs for competence, autonomy, and relatedness are being met by their teachers.

The need for competence refers to the feeling that one is competent when interacting with the environment. It involves an understanding of how to attain an outcome and how to effectively perform the actions needed to accomplish a goal (Deci, Vallerand, Pelletier, & Ryan, 1991). Teachers can support students' need for competence by providing structure (Jang, Reeve, & Deci, 2010; Skinner & Belmont, 1993). An example of structure-providing teacher behavior is framing students' learning activity with explicit directions and guidance (Jang et al., 2010).

Autonomy refers to self-initiation, volition, and willing endorsement of one's own behavior (DeCharms, 1968; Deci, 1975). Teachers can support students' need for autonomy by, for instance, trying to relate learning tasks to students' interests, goals, and values. Moreover, students should have the opportunity to make their own choices (Assor, Kaplan, & Roth, 2002).

The need for relatedness refers to experiencing a feeling of belonging and connecting with others. Students need to feel strong and stable interpersonal bonds (Baumeister & Leary, 1995; Ryan & Deci, 2000). Experiencing emotional security is required to actively explore and effectively deal with the environment (La Guardia & Ryan, 2002). A teacher can support this need by showing involvement, which involves creating a warm, supportive, and nurturing relationship with the student (La Guardia & Ryan, 2002).

STUDENTS WITH DEAFBLINDNESS

Students with deafblindness can be divided into two main categories: students with congenital deafblindness (CDB) and students with acquired deafblindness (ADB) (Danermark & Möller, 2008). Each type of deafblindness can cause specific problems with regard to communication, orientation, and information. All these domains can influence students' motivation to learn in multiple ways.

Students with CDB are born with hearing and visual impairments. Since those impairments existed before language acquisition, their ability to communicate is seriously hindered. However, communication with others is vital to gain access to the environment. Access to auditory and visual information is crucial to triggering interest in the environment (Rødbroe & Janssen, 2006). Being motivated to approach, explore, and learn about objects and people in the environment requires knowledge of their existence. If a person receives no visual and auditory stimulation from the environment, curiosity does not develop to the level necessary to be a strong motivator (McInnes & Treffry, 1982). The environment

may even be a frightening place full of unpredictable situations. It can be out of reach, uninteresting, chaotic, or meaningless, until the teacher provides relevant experiences that show the student what the environment has to offer (Rødbroe & Janssen, 2006). Without teachers who offer enriching and challenging experiences, students' motivation might not be triggered.

Students with ADB develop sensory loss later in life, after they have developed a means of communication. This loss could be the result of an accident or a genetic syndrome such as Usher syndrome (Aitken, 2000). Students with ADB also have a unique set of issues that can influence their motivation. Although they often are able to function more independently than students with CDB, they often experience problems in adjusting to their acquired dual sensory impairments (Dalby et al., 2009). A study by Hersch (2013) revealed that people experience becoming deafblind (either gradually or suddenly) as very challenging: practically, emotionally, and psychologically. Moreover, they often report feelings of social isolation, loneliness, and depression (Hersch, 2013), all of which are expected to negatively influence students' motivation. However, when ADB is not accompanied by other impairments and students have normal intelligence, they can pursue regular academic programs in school (Aitken, 2000).

FOSTERING STUDENTS' MOTIVATION BY ENHANCING TEACHERS' NEED SUPPORT

Since SDT states that the needs for competence, autonomy, and relatedness are universal (Deci & Ryan, 2000), we assume that students with deafblindness also need teachers to support those needs in order to feel motivated for a learning activity. We also assume that teachers need to provide structure, autonomy support, and involvement to support students' needs. However, the content is expected to be different for each student. For instance, a teacher of a student without sensory impairments might provide structure by writing the lesson content on a blackboard. A teacher of a student with ADB might provide the student with an enlarged text of the lesson content. A teacher of a student with CDB might use calendars, scripts, or routines to provide structure. In this study, we want to explore if and how teachers express need-supportive behavior and to evaluate the effectiveness of an intervention aimed at improving the teacher's and student's behavior. An effective intervention should not only improve teachers' need-supportive behavior, but it should also enhance the motivation of students with deafblindness.

In regular education, interventions focused on improving students' motivation

by coaching teachers have been shown to lead to positive outcomes, such as improved engagement with learning material (McLachlan & Hagger, 2010; Reeve, 1998; Reeve, Jang, Carrell, Jeon, & Barch, 2004; Tessier, Sarrazin, & Ntoumanis, 2010; Su & Reeve, 2011). So far, there have been no attempts to explore whether these positive effects can also be attained in the education of students with deafblindness. As such, this study attempts to close that gap.

STUDY AIM

The aim of this study is to examine the effectiveness of an intervention designed to increase student motivation and engagement by enhancing teachers' need-supportive behavior. This study will address the following research question: "To what extent does an intervention enhance teachers' need-supportive behavior and, if it does, to what extent does it also enhance students' motivation and engagement?" In order to answer these questions, we will explore differences within and between the groups (ADB and CDB) over time (pre-test versus post-test and follow-up).

Method

This study can be divided into two parts: the pilot studies and the main study. Both comply with the guidelines described in the World Medical Association's Declaration of Helsinki on Ethical Principles for Medical Research Involving Human Subjects. Informed consent forms were obtained from teachers, parents, and/or students.

THE PILOT STUDIES

Pilot studies 1 and 2 were conducted to develop the coding form. First, we developed the coding form (Appendix C) and coding manual based on SDT literature, existing SDT questionnaires, and literature on deafblindness. Second, we made video recordings of a teacher and a student with CDB (pilot study 1) and ADB (pilot study 2) during various learning activities of various durations at different times. Third, we used the coding form to code all the collected video material. Last, we adjusted the coding form if necessary.

The intervention and self-report questionnaire were developed, implemented and evaluated in pilot study 3 (focused on a teacher and a student with CDB) and pilot

study 4 (focused on a teacher and a student with ADB). We made video recordings during pre-test, post-test, and follow-up phases and coded them using the coding form. Last, the coding form, the coding manual, the intervention, and the self-report questionnaire were finalized for the main study.

THE MAIN STUDY

PARTICIPANTS

The participants were recruited from mainstream and special primary and secondary schools in the Netherlands. Inclusion criteria required students to have CDB or ADB and teachers to regularly (daily or weekly) teach these students. Seven teacher-student pairs participated: four included students with CDB and three included students with ADB. None of the students were completely deaf and blind. The student characteristics are presented in Table 1; we derived this information from an analysis of student files and interviews with teachers. For privacy reasons, all names have been changed.

The four students with CDB all attended a special school that provides primary and secondary education for students with deafblindness. The class size was small (on average, a 2:1 student-teacher ratio). In the regular primary-school setting, one teacher taught different subjects during the day. We focused on one type of class or lesson for each student. For three of the students this was a physical education lesson; for the fourth student this was a language education lesson.

Two of the students with ADB attended a special secondary school for students with hearing loss or severe speech disorders. As in regular secondary-school education, each teacher taught his/her own subject. A home economics teacher (cooking class) and a biology teacher participated in this study. Both classes had a 6:1 student-teacher ratio.

The third student with ADB attended a regular secondary school. The Dutch-language teacher participated. The student-teacher ratio in this class was 25:1. The student was accompanied by a text transcriber who used a laptop. The teacher wore an FM system and used a large screen in addition to a blackboard.

TABLE1 Participant Characteristics

Congenital deafblindness					Acquired deafblindness						
Educational setting					James ^(S) & Bruce ^(T)	Tanya ^(S) & Helen ^(T)	Peter ^(S) & Betty ^(T)	Diana ^(S) & Rachel ^(T)	Violet ^(S) & Clark ^(T)	Marie ^(S) & Katherine ^(T)	Selina ^(S) & Susan ^(T)
Educational setting					Primary and secondary school for students with deafblindness	Primary and secondary school for students with deafblindness	Primary and secondary school for students with deafblindness	Primary and secondary school for students with deafblindness	Regular secondary school	Secondary school for students with hearing impairments or severe speech disorders	Secondary school for students with hearing impairments or severe speech disorders
Student					Gender	Male	Female	Male	Female	Female	Female
Age					12	15	13	17	15	14	15
Diagnosis					Zellweger spectrum syndrome	CHARGE syndrome	Cornelia de Lange Syndrome	CHARGE syndrome	Refsum disease	Usher syndrome, type 1C	Duane's syndrome
Visual impairment					Mild (with glasses): nystagmus	Moderate: coloboma	Moderate: nystagmus	Mild: coloboma	Mild (with glasses)	Mild (with glasses)	Abnormal eye movements. Difficulties rotating one or both eyes outward.
Hearing impairment					Severe. Moderate with hearing aid	Moderate	Moderate	Deaf. Moderate with hearing aid	Moderate	Mild	Profound

Teacher	Congenital deafblindness					Acquired deafblindness				
	James ^(S) & Bruce ^(T)	Tanya ^(S) & Helen ^(T)	Peter ^(S) & Betty ^(T)	Diana ^(S) & Rachel ^(T)	Violet ^(S) & Clark ^(T)	Marie ^(S) & Katherine ^(T)	Selina ^(S) & Susan ^(T)			
Gender	Male	Female	Female	Female	Male	Female	Female			
Age	49	53	49	45	62	31	60			
Years of experience in education	23 years at this school	29 years at this school	17 years at this school	12.5 years at this school	4 years as a teacher in regular primary education; 27 years as a school principal in regular primary education; 12 years as a teacher in regular secondary education	4.5 years at this school	30 years at this school			
Years teaching this student	3	2	1	1.5	1	2	1			

Note. (S) = student. (T) = teacher.

DESIGN

We used a multiple case study approach with a pre-test, post-test, and follow-up design. We used video observations and teachers' self-report questionnaires to assess improvements in teachers' need-supporting behavior. We only used video observations when assessing improvements in students' engagement.

The study design consisted of eight phases: pre-test phase 1 and 2 (2 weeks); intervention phase 1 and 2 (2 sessions during 2 weeks); post-test phase 1 and 2 (2 weeks); follow-up phase (1 week); and intervention phase 3 (1 session). During the pre-test, post-test, and follow-up phases a trained cameraman made video recordings of the lessons.

INTERVENTION

The goal was to enhance teachers' need-supportive behavior through a three-phase intervention protocol. In the first phase, we explained SDT to the teachers and presented the dimensions of need-supportive teaching. We then administered a teacher self-report questionnaire. Next, we used video analysis to coach teachers in improving their need-supportive behaviors. We used videos from the pre-test phase. Video analysis has been demonstrated to be an important tool for coaching educators of children with deafblindness (Damen, Janssen, Huisman, Ruijsenaars, & Schuengel, 2013; Janssen, Riksen-Walraven, & Van Dijk, 2002; Martens, Janssen, Ruijsenaars, & Riksen-Walraven, 2014). The video analysis involved the teachers watching video clips with the coach, with the coach providing feedback on the teachers' need-supportive teaching. Moreover, teachers were asked to think of strategies to incorporate need-supportive behaviors into practice within the classroom setting. In the last part of phase one, we introduced an assignment: teachers were asked to look for examples of need-supportive teaching in the course of their workday. The goal was to identify their need-supporting teaching strategies. They were given the information on need-supportive teaching that was provided during the first phase as homework.

In the second phase of the intervention, we provided teachers with a summary of the previous phase and discussed the homework assignment. The remainder of the time was fully devoted to additional video coaching using other video fragments.

The third intervention phase took place after we made the final follow-up video recordings. Once again, we first asked the teachers to fill in the teacher self-report questionnaires. The intervention ended with an evaluation in which we asked the teachers how they experienced the video recordings and the training sessions.

CODING PROCEDURE

All the videos were coded using the coding form developed in the pilot studies (see Appendix), in which we used Hawkins and Dobes's (1977) descriptions of operational definitions to formulate items that are objective, clear, unambiguous, and easily understood and that refer directly to observable characteristics. We used the same coding form to code videos of students with CDB and ADB, to enable comparison between and within groups.

Seven trained observers coded the videos. All the observers had Master's degrees in Psychology or Pedagogy and had followed a standardized training procedure in order to fully understand all categories of the coding form. The training was based on the steps to train observers described by Hartmann (1984) and included, among other things, learning the coding manual, practicing, and retraining. Each observer coded all videos of a teacher-student pair. We gave the observers detailed background information about the teacher, the student, and the setting.

The authors did not code the videos themselves to ensure that the outcomes did not inadvertently reflect the authors' desires. The observers were not informed about the phase of the study in which videos were made. Two of the six observers had obtained degrees in Dutch Sign Language Skills; they coded the videos in which knowledge of sign language was required. If necessary, a professional sign language interpreter helped to translate the signs made by the teacher and student.

VALIDITY AND RELIABILITY

We took a number of steps to assess the validity and reliability of the coding form. First, its content and construct validity were underpinned by recommendations by Heath, Hindmarsh, and Luff (2010). It was based on a review of literature and many hours of observation, and discussed with various researchers, including experts on SDT and experts on deafblindness. We created several refined versions over time.

Second, two independent raters judged whether the items of the coding form fitted the categories (see Appendix C). In other words, each rater divided the 17 items over the categories structure, autonomy support, involvement and engagement. We calculated the percentage agreement between the division of items by the authors and the division by the two raters. The percentage agreement was 88% for rater 1 and 82.4% for rater 2.

To assess intra-observer reliability, one observer rated the same videos of two teacher-student pairs at two different times. The percentage of intra-observer agreement

was 98.5% the first time and 100% the second time.

To prevent the observers' personal views from influencing their coding, we ensured that two observers coded the same material and assessed how well their views were aligned (Bakeman & Gottman, 1997). In line with the recommendations by Barlow, Nock, and Hersen (2009), a primary observer coded all videos, while a second observer coded 15-25% of the collected videos. The mean length of the coded videos per pair was 6 hours, and the mean length of the videos coded by a second observer was 25% (1.5 hours).

Percentage agreements for the group of students with CDB were 95%, 88%, 85%, and 80%. Since percentage agreement does not take chance into account, we also calculated Cohen's Kappa, which does account for chance (Watkins & Pacheco, 2000). Cohen's Kappa values were 0.88, 0.73, 0.73 and 0.60. The percentage agreements for the group of students with ADB were 98%, 80%, and 97%. Cohen's Kappa values were 0.86, 0.63, 0.90. All ratings met or exceeded the 80% percentage agreement standard recommended by Gelfand and Hartmann (1975). Moreover, the Cohen's Kappa values were all above the recommended cut-off value of 0.60 for Kappa-like statistics. Therefore, all indications of validity and reliability are at acceptable levels.

QUESTIONNAIRE

We administered a questionnaire before and after the intervention to assess the teachers' self-reported levels of need-supportive behavior. Before the start of the study and after the follow-up phase, we asked the teachers to indicate the degree to which they thought they supported their students' needs for competence, autonomy, and relatedness in everyday practice: they gave themselves scores on a 10-point scale. When filling in the scores for the second time, the teachers were not allowed to see the scores they gave themselves at the beginning of phase one. We used this questionnaire data to provide additional information on the effectiveness of the intervention.

DATA ANALYSIS

First, we analyzed the results of the coded videos. To make all the results comparable between all cases we selected the first 15 minutes of an activity for further analysis. We calculated the aggregated scores of the selected data for each of the four categories on the coding form and explored the individual patterns and group-level patterns. To compare the two groups (CDB versus ADB), we calculated mean scores for each group

for the pre-test, post-test, and follow-up phases.

In addition to the video analysis, we selected a number of illustrative examples of changes in teacher practices in line with the tenants of SDT. We compared video observations of the teacher-student pairs in the pre-test phase with the videos in the post-test and follow-up phases to mark differences in teacher behavior. The first author described examples of teacher behavior that changed as a result of the intervention and the second and third authors reviewed these examples.

Next, we assessed the changes in teachers’ self-reported scores by comparing the pre-test and post-test scores. We then calculated the percentage improvement for each dimension of need-supportive behavior.

Results

The intervention was assumed to be effective when teachers express more need support and students express more engagement. First, we will discuss the findings with regard to teachers’ need-supportive behavior, which include the video analysis and the self-report data. We will compare the scores of teachers in the ADB group to those of teachers in the CDB group. Then we will discuss the findings from the video analysis with regard to students’ engagement.

VIDEO ANALYSIS OF TEACHERS’ PROVISION OF NEED SUPPORT

TEACHERS’ PROVISION OF STRUCTURE

Table 2 shows teachers’ scores for the provision of structure based on the video analysis. Three teachers (two CDB; one ADB) clearly improved at some point after the intervention. When short-term and long-term group effects were compared, we found that more teachers in the ADB group improved during the post-test and more teachers in the CDB group improved during the follow-up. The range of scores in the follow-up phase (12–15) improved more for the CDB group when compared to the pre-test (-2–15), than for the ADB group (2–15 in both pre-test and follow-up). To conclude, in general, teachers in the CDB group seemed to improve more.

TABLE 2 TEACHERS’ PROVISION OF STRUCTURE

	Pre-test		Post-test		Follow-up
	1	2	1	2	
Congenital deafblindness					
Bruce & James	13	-	11	13	12
Helen & Tanya	6	-	-	3	12
Betty & Peter	15	-	15	13	14
Rachel & Diana	-2	7	-	9	15
Acquired deafblindness					
Clark & Violet	3	10	11	14	8
Katherine & Marie	-	2	2	12	2
Susan & Selina	15	15	15	15	15

Note. The scale ranges from -15 to 15; a dash indicates that the lesson was not undertaken in this phase.

TEACHERS’ PROVISION OF AUTONOMY SUPPORT

Overall, scores for teachers’ provision of autonomy support (see Table 3) were lower than the scores for the teachers’ provision of structure. Five teachers improved at some point after the intervention (three CDB; two ADB), though their scores did not always remain high over time. When short-term and long-term group effects were compared, we found that teachers most improved during the post-test phase. The range of scores in the follow-up phase (2–8) improved for the CDB group compared to the pre-test phase (-3–8); this was not the case for the ADB group (0–6 in the pre-test phase and -2–0 in the post-test phase). In sum, the CDB group seemed to attain most positive intervention effects.

TABLE 3 TEACHERS' PROVISION OF AUTONOMY SUPPORT

	Pre-test		Post-test		Follow-up
	1	2	1	2	
Congenital deafblindness					
Bruce & James	3	-	11	8	8
Helen & Tanya	4	-	-	8	6
Betty & Peter	8	-	8	4	6
Rachel & Diana	-7	-3	-	-3	2
Acquired deafblindness					
Clark & Violet	5	0	6	2	0
Katherine & Marie	-	6	3	5	0
Susan & Selina	5	5	8	8	-2

Note. The scale ranges from -12 to 12; a dash indicates that the lesson was not undertaken in this phase.

TEACHERS' INVOLVEMENT

Table 4 reveals that overall, teachers in both groups showed higher levels of involvement during the pre-test phase than they did for structure and autonomy support. Results in the CDB group were more positive than those in the ADB group. All the teachers in the CDB group retained their positive scores, while two teachers in the ADB group saw their scores decrease somewhat over time. Moreover, scores for the CDB group ranged from 7 to 12 in the pre-test phase and from 9 to 12 in the follow-up phase. Scores for the ADB group ranged from 9 to 11 and 7 to 9, respectively, so their mean scores declined somewhat. Based on these ranges in group scores, we can conclude that the CDB group's scores were more positive after the intervention.

TABLE 4 TEACHERS' INVOLVEMENT

	Pre-test		Post-test		Follow-up
	1	2	1	2	
Congenital deafblindness					
Bruce & James	12	-	12	12	12
Helen & Tanya	11	-	-	12	10
Betty & Peter	11	-	12	10	12
Rachel & Diana	7	9	-	7	9
Acquired deafblindness					
Clark & Violet	9	9	9	9	9
Katherine & Marie	-	9	7	4	8
Susan & Selina	9	11	10	10	7

Note. The scale ranges from -12 to 12; a dash indicates that the lesson was not undertaken in this phase.

EXAMPLES OF CHANGED TEACHER BEHAVIOR

After the intervention, all the teachers tried to actively improve their provision of need support. Here are three examples. First, after the intervention Katherine decided to provide more structure by preventing students from other classes to step in and out to talk to the teacher and students by closing the door and putting a "do not disturb" sign on it.

Second, Betty used reference objects to let Peter know which activity he was going to do (e.g., one of his toys represented playtime). Before the intervention, all the reference objects were stored in a drawer and Betty had to place a new object from the drawer in a box for each new activity. Peter then had to pick the object up out of the box. After the intervention, Betty created a new reference object method where all the objects were hung up on a coatrack. This gave Peter an overview of which activities would occur during the day and made it easier for him to choose between them.

Third, Clark adjusted his classes by writing on the blackboard more. For instance, before his lesson started, he wrote down the content of the lesson and the homework. Moreover, in the post-test observations it was apparent that he had enlarged the text for Violet; she seemed very pleased with this adjustment. All these examples show that teachers were willing to enhance their level of need support and they came up with

creative ideas to accomplish this.

TEACHERS’ SELF-REPORTED INDICATIONS OF NEED SUPPORT

Table 5 shows the results of the teacher self-report questionnaire that was administered before and after the intervention. Teachers reported their need-supportive behavior on a 10-point scale. In the pre-test phase, 71% of the teachers already reported a score of 7 or higher, and 38% reported a score of 8 or higher. In the post-test phase, 95% of the teachers reported a score higher than 7, and 71% higher than 8. The overall mean improvement was 9%, and four teachers reported an improvement of at least 30%. Overall, the teachers of the students with CDB stated that they provided more need support after the intervention than the teachers of the students with ADB. Within this group, teachers indicated the most improvement in terms of autonomy support.

When comparing observed and self-reported need support scores, for all teachers we found differences between their self-reports and their observed behavior. In general, scores related to observations of provision of structure were higher than self-reported scores. On the other hand, teachers self-reported more improvement on involvement than their observation scores showed.

TABLE 5 Teacher Self-Report Questionnaire Results

	Structure			Autonomy Support			Involvement		
	Pre-test	Post-test	Improvement	Pre-test	Post-test	Improvement	Pre-test	Post-test	Improvement
CDB									
Bruce	8	8	-	7	8	10%	8	9	10%
Helen	7	7	-	5	8	30%	6.5	8	15%
Betty	7.5	8	5%	8.5	8.5	-	8.5	8.5	-
Rachel	4	7	30%	6	9	30%	8	9	10%
ADB									
Clark	7	7	-	7	7	-	3.5	8	45%
Katherine	6.5	6	-5%	7	7	-	7.5	8	5%
Susan	8	8	-	8	8	-	8	8	-

Note. The pre-test and post-test scores are the teachers' self-report on a 10-point scale (0-10). The improvement scores are the percentages of improvement, when these two scores are compared.

VIDEO ANALYSIS OF STUDENT ENGAGEMENT

Table 6 shows that 5 out of 7 students improved at some point after the intervention. In the ADB group, scores were somewhat more positive than for the CDB group. One student in the CDB group and one student in the ADB group had already the highest possible engagement level during the pre-test phase.

When short-term and long-term group effects were compared, we found improvements during both post-test and follow-up phase. Moreover, improvements attained during the post-test were sustained during the follow-up. Only one student showed a declined engagement level during the follow-up.

While the greatest individual improvement was attained by a student in the CDB group (4 in the pre-test to 11 in the follow-up phase), the range of scores improved more in the ADB group (range: 8-12 pre-test to range: 11-12 follow-up) compared to the CDB group (range: 1-12 pre-test; range: 2-12 follow-up).

When looking at the connection between teachers' need-supportive behavior and students' engagement, the findings imply that high or low engagement scores were not always accompanied by high or low levels of need support. Moreover, changes in teacher support over time were not always identical to changes in students' engagement levels.

TABLE 6 Students' Engagement

	Pre-test		Post-test		Follow-up
	1	2	1	2	
Congenital deafblindness					
Bruce & James	12	-	12	12	2
Helen & Tanya	10	-	-	12	12
Betty & Peter	4	-	4	10	11
Rachel & Diana	3	1	-	0	6
Acquired deafblindness					
Clark & Violet	10	10	10	10	11
Katherine & Marie	-	8	8	12	12
Susan & Selina	11	12	12	12	12

Note. The scale ranges from -12 to 12; a dash indicates that the lesson was not undertaken in this phase.

Discussion

This study aimed at the design and the evaluation of an intervention to increase students' motivation and engagement by enhancing teachers' need-supportive behavior. In this section, we will discuss the main findings. Thereafter, we will address possible limitations, and recommendations for future research.

The first main finding is that, in general, teachers provided involvement the most compared to the two other dimensions of need support. Autonomy support was the least provided dimension of need support. Due to time restraints or overprotectiveness, it might be difficult for teachers to provide autonomy support. Other SDT research has also found that teachers are not used to expressing autonomy-supportive teaching behavior. For instance, a study by Reeve et al. (2004) found that teachers generally rely on controlling motivational strategies, which are more familiar and more endorsed by teachers. Whilst SDT research found that an autonomy-supportive motivating style is more strongly associated with positive outcomes than a controlling style (Ryan & Deci, 2000).

The second main finding is that teacher's provision of structure and autonomy seem to improve the most by the intervention. Previous research also illustrates that even brief interventions based on SDT in regular educational settings can be effective in modifying teachers' need-supportive behaviors (McLachlan & Hagger, 2010; Reeve, 1998; Reeve et al., 2004). This study appears to confirm previous positive findings and provides support for an intervention based on the theoretical underpinnings of SDT in special education settings. Although some intervention effects were larger than others and scores varied within the two groups, overall the findings provide indications that the intervention enhanced teachers' provision of need support through coaching aided by video analysis. These indications may even have been underestimated because of ceiling effects that occurred in both teacher and student behavior. Ceiling effects could be observed when pre-test scores were already at the maximum possible level so no improvement was possible or necessary.

Third, in general, the intervention appears to have larger effects related to supporting all three needs on the teachers in the CDB group than on teachers in the ADB group. Explanations for this finding are factors relating to differences in the school context such as teacher-student ratio, lesson time, and experience with educating students with deafblindness.

Comparing the number of students in the ADB group to the CDB group, it is logical to assume that providing need support is more difficult in the ADB setting. In the ADB setting classes sizes are much larger, therefore it is more difficult for a teacher to support the needs for each individual student. Moreover, time limitations seem to be more influential in the ADB setting. In the CDB setting, one teacher often works with the student during the whole day while in the ADB setting teachers have less time with their students. This affects for instance the teachers' involvement. In the CDB setting a school day incorporates planning time for talking about the student's personal life. This is not the case in the ADB setting. For instance, Clark indicated that he needs 45 minutes to teach the lesson content to the student. Due to time limitations, he chooses to focus on the lesson content instead of on personal involvement. Time limitations can therefore limit a teacher's ability to get to know his or her students' interests, preferences, and personal goals.

The differences between the groups can also be explained by the teachers' experience. The four teachers of students with CDB had all worked at a special school for students with deafblindness for 12½ to 29 years. The teachers in the school for deaf and hard of hearing students also had a lot of experience (4 ½ and 30 years), as did the regular education teacher (42 years), but they did not have experience in educating students with deafblindness. This might impact their need-supportive behavior and thereby explain the differences between the CDB and ADB groups.

Fourth, besides between-group differences, also within-group differences were observed. For instance, in the ADB group, Susan's and Katherine's scores were very different. While Susan continuously expressed the highest possible levels of structure provision, Katherine's levels were overall much lower. The difference between Susan and Katherine can be explained by the lesson content. Susan's classes had a traditional nature, with the teacher in front of the classroom and the students sitting at their desks and listening to the teacher. In Katherine's cooking classes, students walked through the kitchen getting food out of the refrigerator or putting pans on the stove. Since the students did not all make the same meals, Katherine gave no class-wide instructions. Moreover, conversations between students and between Katherine and the students were often more informal and unrelated to the lesson content. Katherine scored highly in the post-test phase, but that could be because in that lesson, the students' cooking skills were tested. Like in the other cooking classes they had to make a meal, but this time Katherine carefully observed them and graded them at the end of the class. In sum, variations in scores between

teachers and students can be explained by the differences in lesson content and classroom organization.

A fifth main finding was that, all the teachers were positive about the framework, and willing to think of ways to incorporate more need-supportive behavior into their classes. The examples of changed teacher behavior showed that the teachers were willing to enhance their need-supportive teaching behavior. Their often creative strategies to accomplish this had a positive influence on students' engagement.

Sixth, the results imply that all students improved their level of engagement at some point during the post-test and/or follow-up phases, except for two students who had already achieved maximum engagement levels during the pre-test. The results also indicated that high or low engagement levels were not always accompanied by high or low levels of need support.

There are multiple explanations for these variations in scores. It might be that students do not need fulltime need support during an activity to stay engaged; they can stay engaged even when need support is absent now and again. Moreover, other influences outside the teacher-student relationship can influence students' engagement (e.g., personal factors, such as feeling ill or tired). This might be the case in the follow-up measurement of James, given his low engagement level. Last, a lack support of one need could be compensated for by the support of another need. For instance, the results indicate that teachers often provided structure and involvement, but no autonomy support. In this case, the students' engagement was often still present, suggesting that the lack of autonomy support might be compensated for by the provision of structure and involvement.

Last, the results of the teacher questionnaire indicated that the teachers of students with CDB self-reported more improvement with regard to their level of structure and autonomy support than the ADB group. Moreover, for all teachers there were differences between their self-reports and their observed behavior. These differences can be explained by the fact that after the intervention, teachers might have looked differently at their own behavior and started to realize whether and how they supported their students' needs. Their ideas about the quality of their need support might be different than their observed need support score indicates. With regard to structure, teachers may have felt that they could do better, though they had already improved. With regard to involvement, they may have felt they had improved, even though they had already attained high scores in the pre-test phase. The differences between observed and self-reported intervention effect scores

indicate that using both types of scores adds value.

LIMITATIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH

A first limitation is related to missing data. In order to enhance the ecological validity of the video data, we did not give the teachers any requirements about lesson content or duration before the study started. Teachers were told to do what they would normally do. Since the teachers used fixed day and week schedules, we assumed we would collect videos of the same lessons and the same duration over the weeks, which would make it possible to compare lessons over the phases. This unfortunately did not seem to be the case in the CDB group: lessons and their duration varied. Therefore, it was difficult to select one activity for each student that was recorded for at least 15 minutes in each phase. Therefore, one suggestion for future research is to ask teachers to name a predefined activity with a fixed duration that will be constant over the phases. Nonetheless, in this study, we chose to keep the data collection as unobtrusive and as natural as possible. This is in line with Pelham and Blanton (2003), who stated that the best kind of observational research is unobtrusive.

Another limitation is the diverse nature of our target group. It might be suggested that future research should create subgroups that are more similar (e.g., in terms of students, lesson content, and settings). Unfortunately, this does not seem to be an option for this heterogeneous target group. Although the heterogeneity can be looked at as limitation, it can also be regarded as a strength: we now know the intervention seem to be applicable to a diverse range of settings with different teachers and different students.

In accordance with previous research by Reeve et al. (2004) we were able to coach teachers to use a more autonomy-supportive teaching style by translating autonomy support into concrete practices that can be implemented in practice. Moreover, based on the findings of a meta-analysis, Su and Reeve (2011) demonstrated conditions under which intervention programs designed to support autonomy conditions are highly effective. All their suggestions are present in our intervention. According to them, programs should include multiple and complementary elements of autonomy support within an intervention. Moreover, effective programs tend to deliver the training in only one or a few sessions for a moderate duration of time (hours, not days or months) and to offer follow-up activities such as take-home information manuals or structured journal activities.

Though the intervention did provide positive effects in teachers' need-support,

autonomy support was still the least expressed dimension of need-support. Moreover, the positive intervention effects in the ADB post-test measurement all decline during follow-up. Since several studies have demonstrated that autonomy-supportive teaching is related to educational benefits, enjoyment, engagement, and performance (e.g. Reeve & Jang, 2006), a focus on coaching teachers to use autonomy-supportive teaching strategies is strongly recommended. Therefore, the developed teacher intervention could be expanded by adding an additional training session that is specifically focused on extra coaching of autonomy-supportive teaching.

CONCLUSION

This is the first study to apply an intervention based on SDT in the setting of educating students with deafblindness. In addition, it is also unique that this study addressed both teacher-student interactions with students with CDB and students with ADB in one study. The study indicates that even small levels of need support might be enough to help students fulfill their needs and make a difference in their engagement. The added value of this study is that it is possible to accomplish positive changes in teacher and student behavior in a short amount of time.